

Original Research Paper

Community Empowerment through Online Training of Drumstick Tree (*Moringa oleifera*) Cultivation and Its Utilization during the Covid-19 Pandemic for Urban Communities in Kediri, East Java, Indonesia

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Abstract: Up to these days, many people globally have not yet realized the wondrous benefits of the drumstick tree (*Moringa oleifera*), such as citizens living in Kediri, East Java, Indonesia. Each person of the communities in the region mostly has spacious enough yards that can be optimized for drumstick tree cultivation. This community service aimed to (a) enhance motivation in gardening activities of urban communities; b) improve knowledge and skills of urban communities in cultivating, harvesting, and processing drumstick tree; c) increase greenery areas in the house; and d) improve food security and family health during the Covid-19 pandemic. Activities in the present community development were distributing gardening and education packages to the target community of Kediri citizens through online media ranging from planting, maintaining, and processing drumstick trees as a home industry business in order to enhance their income. Participants of these activities were also given some materials regarding the topic in the form of booklets and online collective assistance.

Keywords: Community Empowerment; Drumstick Tree; Cultivations; Urban Community; Online

Introduction

Kediri is one of the districts located in the province of East Java, Indonesia. Previously, the local government center was in the city of Kediri, but since the reign of the regent H. Sutrisno, the district capital of Kediri has moved to Ngasem District. Kediri Regency is bordered by Jombang, Blitar, Malang, Tulungagung, and Nganjuk Regencies. The city of Kediri is an enclave of the Kediri Regency. Kediri Regency has a total area of 1,523.97 km² which consists of 26 districts (Kediri

Agency for Regional Development 2022). Based on the 2020 Indonesian Statistics census, the population of this district in the year was 1,635,294, with a population density of 1,073 people/km².

Currently, the world still encounters the Covid-19 pandemic, which impacts a global health crisis. The pandemic is widespread across the globe, including in Indonesia. The Covid-19 pandemic affects many facets of life, including economic, social, and environmental aspects. According to Caraka et al. (2020), Covid-19 caused global economic setbacks because of the implementation of the large-scale restrictions. Besides avoiding the

spread of Covid-19 through health protocols (i.e., washing hands, wearing masks, maintaining distance, staying away from crowds, and reducing mobility), people also try various healthy living alternatives, such as herbal foods consumption to enhance body immunity. Since a very long time ago, herbal products and dietary plants have been prescribed for numerous kinds of diseases (Petrovska 2012; Asgari 2014; Demeke et al. 2021).

One of the herbal plants that could boost human immunity against Covid-19 is *Moringa oleifera* (drumstick tree). Sen et al. (2021) discovered that various parts of the drumstick tree might be used as a potential preventive and therapeutic material against Covid-19 due to its available compounds, such as isorhamnetin, kaempferol, and apigenin. Ignatov (2020) found that drumstick tree contains high levels of potassium which can lower infection in Covid-19 patients. The drumstick tree is an edible plant species that belongs to the family of Moringaceae, which is mainly utilized as food and medicine (Meireles et al. 2020; Kashyap et al. 2022). The plant is a native species of the Indian subcontinent but is broadly spread from India to Africa and numerous other tropical and arid countries (Al_husnan et al. 2016), including Indonesia.

Drumstick tree leaves are nutritious and practical to solve malnutrition problems (Razis et al. 2014). The drumstick tree possesses high nutrition and a variety of essential phytochemicals from all parts, such as leaves, pods, and seeds (Gopalakrishnan et al. 2016). Drumstick tree's leaves contain numerous valued compounds, such as protein, vitamin, iron, calcium, ascorbic acid, and antioxidants (carotenoids, flavonoids, and phenol) (Sultana and Anwar, 2008). Drumstick tree's leaves contain seven times higher vitamin C than oranges, 17 times higher calcium than milk, ten times higher vitamin A than carrots, 25 times higher iron than spinach, and 15 times higher potassium than bananas (Rockwood et al. 2013). The plant's leaves are also potential anticancer, antioxidant, antidiabetic, anti-inflammatory, and antimicrobial agents (Saini et al. 2016; Gupta et al. 2018; Kashyap et al. 2022). Even due to its excellent benefits, the drumstick tree is called a "Miracle Tree" or "Tree of Life" (Kashyap et al. 2022) or "Superfood" (Balakumbahan et al. 2020; Islam et al. 2021). Apart from all the aforementioned benefits, the drumstick tree is

rapid-growing, able to grow in dry and hot climates, and drought-resistant (Alhakmani et al. 2013; George et al. 2016; Olson et al. 2016; Devkota and Bhusal 2020; Anzano et al. 2021; Islam et al. 2021).

Through this community service, participants were expected to utilize their yards for gardening activities as a function of health improvement and reforestation. Gardening activities and the availability of green areas at home are also therapies to reduce stress levels during the Covid-19 pandemic (Zhang et al. 2021; Afrianto et al. 2021; Andini et al. 2021; Giraud et al. 2021; Lin et al. 2021; Afrianto and Diannita 2022; Cerda et al. 2022; Coyoca et al. 2022; Egerer et al. 2022; Sia et al. 2022). Activities of this community development activities were distributing gardening and education packages through online media ranging from planting, maintaining, and processing the drumstick tree as a home industry business idea to raising residents' income. Our objectives for this community service were to a) increase motivation in gardening activities of urban communities; b) increase knowledge and skills of urban communities in cultivating, harvesting, and processing drumstick tree; c) increase in greenery in the house area; and d) improve food security and family health during the Covid-19 pandemic.

Methods

About the Program

The target group in the present community service program was the urban community living in the City and District of Kediri, East Java, Indonesia. Each participant received a gardening package by registering through social media, including WhatsApp and Telegram. The participants should also fill out a registration form that was uploaded via a google form. The participants can also visit the nursery center directly to register for the program. The gardening package shared with the participants contained all relevant materials about drumstick tree cultivation and its utilization, such as seeds, polybags, manure/humus, and barcodes/links about cultivation methods, benefits, nutritional content, and technical information to process drumstick tree (Figure 1).



Figure 1. The gardening package contains seeds, polybags, manure/humus

The present community service was carried out in several stages, i.e., preparation, implementation, and evaluation stages (Figure 2).

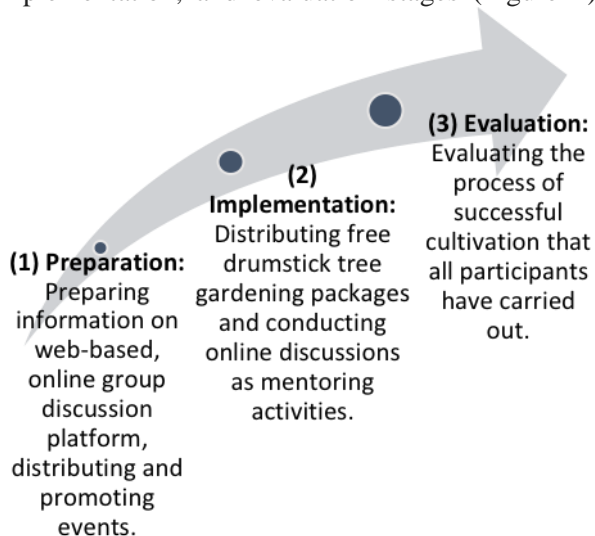


Figure 2. Roadmap of the present community service

1. Preparation stage. The service team prepared several things at this stage, i.e., preparing drumstick tree gardening packages containing all things about the drumstick tree and references to processed products to be made.

2. Implementation stage. At this stage, the service team distributed the free drumstick tree gardening packages. Through online media used as a name tag in the gardening package, beneficiaries could receive information about drumstick tree cultivation techniques by scanning the barcode or clicking the link provided. All information was presented

descriptively, in popular and easy-to-understand language, and with supporting pictures.

3. Evaluation stage. This was the last stage in the program, which evaluated the results that the target citizens have achieved in community empowerment activities. The data was taken by concluding the extent of community understanding of drumstick tree cultivation.

Outcomes

The successful indicators of our community empowerment services are a transformation into better circumstances for the target community. Our expected outcomes of the implementation of this community service are to enhance food security and environmental awareness for urban communities in Kediri during the Covid-19 pandemic, i.e.:

- The Kediri community can meet household nutritional needs by utilizing the drumstick tree as a source of nutrition.
- The Kediri community can intensify their yards with the drumstick tree to reforest residential areas.
- The Kediri community has good institutions through community empowerment.

Results and Discussion

Preparation and Distribution of a Package Gardening

These community empowerment activities were carried out from February to April 2022. Considering that Indonesia was facing the third wave of Covid-19 (the Omicron variant), at the moment, all the activities were performed online. Educational material about the drumstick tree was provided in the form of a booklet. Mentoring activities were done by a WhatsApp group. A high enthusiasm was shown by all participants for all the gardening packages, which indicated rising interest in gardening during the Covid-19 pandemic.

Implementation of Drumstick Cultivation

1. Seeding of drumstick tree seeds

In this empowerment program, we decided to plant the drumstick tree from seeds (using the generative plant propagation method). The first thing to do

was select good quality drumstick tree seeds. The seeds were taken from the pod and then dried under the sun for approximately one day. The seeding was performed in polybags with the seeding media of a mixture of soil and manure. Before the seeds were planted, they were soaked in warm water. The sinking seeds were selected because they were of better quality. After the seeds were selected, they were sowed in the seedling media in a shady place. Watering of the planting seeds was carried out regularly to maintain the humidity of the nursery, but it should not be too wet. Sprouts began to appear at the age of 7-12 days after planting. After the seeds had grown to 15 cm, they were transferred into permanent planting areas.

2. Preparation of the planting holes

Planting holes were prepared for the cultivation of the drumstick tree. Each hole had dimensions of 40 x 40 and a depth of 30 to 40 cm. Each hole was filled using manure and subsequently left for one week before planting.

3. Drumstick tree planting

Drumstick tree seedlings that had reached a height of 30-50 cm were subsequently transferred to the prepared land by tearing polybags and inserted into the planting hole. The planting hole was then closed using the remaining soil around the hole and compacted. The plants were irrigated regularly.

4. Drumstick tree maintenance

The maintenance of the drumstick tree was effortless, i.e., regular watering and trimming of the stems when needed.

Booklet

The educational material about the drumstick tree was presented in the form of a booklet (Figure 3). The booklet contained the following:

(1) Drumstick tree cultivation methods. Drumstick tree cultivation is easy and cheap because the input requirements for its growth are minimal. In these empowerment community activities, the planting of the drumstick tree was from seeds. The advantages of using seeds as a planting material are easy to obtain, easy to do, and produce more plants with simultaneous growth, strong roots, and longer life; (2) Nutritional content of the plant. The lack of use of drumstick tree is probably due to the low level of public knowledge about drumstick tree. Whereas, actually, the drumstick tree has a very high nutritional content, and almost all drumstick tree

parts can be utilized. The explanation in the booklet was visualized with pictures form that is expected to make it easier for readers to understand the nutritional values of the drumstick tree;

(3) Benefits of the plant. This section describes at least ten benefits of the drumstick tree leaves based on a literature review, such as reducing fatigue and anemia, keeping healthy skin, increasing body immunity, increasing muscle growth, anti-stress, improving digestion, releasing energy, improving vision, improving bone health, and antidiabetic; and (4) Drumstick tree processing, which can be consumed in the form of fresh or flour. For fresh consumption, people often cook the leaves of the drumstick tree as a vegetable dish (in Indonesian: *sayur bening*). Meanwhile, people rarely use the drumstick tree in the form of flour. This flour can be used for coloring, tea, or cake ingredients.



Figure 3. Cover booklet about drumstick tree used as an educational material

Conclusions and Suggestions

Herein, community empowerment regarding drumstick tree cultivation and its utilization in the city and district of Kediri, East Java, Indonesia, has been successfully executed. An online donation and training program could effectively improve the community's understanding of the drumstick tree's benefits and their skills in drumstick tree cultivation. However, efforts need to be made to evaluate the success of drumstick tree cultivation until the trees are ready to be harvested. The conditions during the activities where there is still a pandemic can be overwhelmed by creating online material sources and online collective assistance. To ensure the program's sustainability, in the forthcoming, it is necessary to make a collaboration with all relevant parties, including the government, private institutions, non-governmental organizations, and research institutions.

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